Aspiration pneumonia in stroke; study of incidence and risk factors

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Abstract:
Aspiration pneumonia is the chief cause of mortality and morbidity in stroke patients. Both modifiable and non modifiable risk factors determine the incidence of this complication. The present study a prospective study to determine the incidence and risk factors associated with aspiration pneumonia in all types of stroke patients. Of the 138 stroke patients studied over a 2 year period 32 cases (27.5%) had developed aspiration pneumonia. Of the continuous variables high NIHS score and low ASPECT score were directly related to the incidence of aspiration pneumonia(p<0.05) while of the categorical variables left sided strokes, posterior circulation strokes and use of proton pump inhibitors significantly increased the chances of aspiration. The volume of bleed in hemorrhagic strokes was not related. Awareness of these risk factors will help initiate early aggressive measures and avoid mechanical ventilation, prolonged ICU stay and substantially decrease the cost of stroke care.

Key words: Hemorrhagic stroke, aspiration, proton pump inhibitors

INTRODUCTION:
Stroke is the most common cause of death after heart disease and cancer. It is also the leading cause responsible for maximum disability and dependency. Fifteen million stroke cases occur worldwide each year with five million associated deaths. Aspiration pneumonia followed by sepsis is one of the most common complications of stroke as chest infection may affect up to 1/3rd of stroke patients. The aim of this study was to determine the incidence and risk factors associated with aspiration pneumonia in stroke patients.

METHODS:
This was a prospective study conducted in a tertiary care hospital where acute stroke cases are managed in the neurointensive care unit (NICU). The study was conducted over a two year period. All acute stroke cases were initially categorized as ischemic or hemorrhagic strokes. After initial clinical assessment patients underwent a CT scan and/or MRI brain plain. After a complete general and neurological examination the following aspects were stressed upon and recorded.

1 Premorbid conditions
2 Glasgow Coma Scale (GCS)

3 NIHS score (The National Institute of Health Stroke score is a 42 point score based on clinical findings used to prognosticate ischemic stroke patients. Though initially was used for measuring the efficacy of intravenous thrombolysis it has now become a standard scale for prognosticating stroke patients)

4 ASPECT Score: This is a scoring done on CT image where each area of infarct is given a score of 1 and the total subtracted from 10. Lesser the score larger the infarct size and poorer the outcome.

5 Arterial territories affected
6 Volume of bleed in hemorrhagic strokes
7 Use of proton pump inhibitors (PPI)

Aspiration pneumonia was diagnosed using the following criteria.

1 Admission from home
2 Acute onset of at least one major symptom. Cough, fever, or tachypnea
3 Presence of chest rales
4 Radiographic infiltrate.
Exclusion criteria

1. Patients admitted earlier within 30 days of present admission with pneumonia, immunocompromised patients and those with preexisting radiographic abnormalities were excluded from the study.

Statistical analysis

We applied the analysis of variance (one way ANOVA) for continuous variables and multiple regression analysis for categorical variables.

RESULTS:

A total of 138 cases of stroke were studied over a 1 year period. The mean age was 56±7.1 yrs. Males were 67% and females 33%. Ischemic strokes accounted for 110 (79.7%) and hemorrhagic strokes 30 (20.3%). Of the ischemic strokes 80 were in the anterior circulation and 30 in the posterior circulation. Of the 28 hemorrhagic strokes 19 were supratentorial and 9 were infratentorial. The GCS (Glasgow Coma Scale), NIHs score and ASPECT score are shown in Table 1, 2 and 3. If the hemorrhagic strokes the mean volume of bleed was 10.98 ml (brainstem bleeds excluded).

Table 1: GCS on admission

<table>
<thead>
<tr>
<th>GCS</th>
<th>No of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;8</td>
<td>25</td>
</tr>
<tr>
<td>8-13</td>
<td>63</td>
</tr>
<tr>
<td>&gt;13</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 2: NIHs score of ischemic strokes on admission

<table>
<thead>
<tr>
<th>NIHs</th>
<th>No of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;17</td>
<td>20</td>
</tr>
<tr>
<td>10-17</td>
<td>40</td>
</tr>
<tr>
<td>0-10</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 3: ASPECT score (ischemic stroke)

<table>
<thead>
<tr>
<th>ASPECT Score</th>
<th>No of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-10</td>
<td>10</td>
</tr>
<tr>
<td>3-7</td>
<td>80</td>
</tr>
<tr>
<td>&lt;3</td>
<td>10</td>
</tr>
</tbody>
</table>

Aspiration pneumonia was diagnosed in 32 patients (23.2%) and of these 14 cases (10.1%) were intubated and 8 (5.7%) cases required tracheotomy. Ischemic strokes were grouped as per NIHs score and ASPECT score. Severity of hemorrhagic strokes was determined by the volume of bleed. Using one way ANOVA a significant increase in aspiration pneumonia was seen in patients with high NIHs score (>14) and low aspect score (>5) (p <.05). In hemorrhagic strokes cases volume of bleed did not correlate with the incidence of aspiration pneumonia. When we used multiple regression analysis to study the effect of different categorical variables the side of infarct and use of PPI showed a strong association with development of aspiration pneumonia. Those with left side infarct posterior circulation strokes and those who were started on early PPI had a higher incidence of aspiration pneumonia (p<.01).

DISCUSSION:

The present study was prospective study to determine the risk of aspiration pneumonia in acute stroke patients. Though level of consciousness as estimated by GCS fairly predicts the prognosis, early prediction when the GCS is normal is more important. Herein comes the value of NIHs score ASPECT score and side of stroke. We found direct correlation with high NIHs scores and the occurrence of aspiration pneumonia. The ASPECT score is calculated on plain CT scan after the stroke but will require a minimum of 6 hrs for the stroke to appear on CT imaging. ASPECT score is useful only in MCA infarcts and not for the rest of the arterial territories. A well preserved acute stroke patient but with a low ASPECT score has a high chance of developing aspiration pneumonia and it is possible to institute early measures to decrease the severity of aspiration. As expected posterior circulation strokes affect the brain stem and the resultant neurogenic dysphagia is the cause of aspiration pneumonia in these patients. The higher incidence of aspiration pneumonia in left side stroke is probably due to aphasia and apraxia. We found unusually a higher incidence of aspiration pneumonia in those who were given PPI at the onset of stroke. The possible explanation is in the infectivity of micro aspiration contents. The acid milieu of the gastric contents provides protection against bacterial invasion and PPI reduces this protective effect.

Limitations of the study

This was a prospective study where both continuous and categorical variables were included to understand their contribution to development of aspiration pneumonia. We could not categorise pre morbid conditions like smoking malnutrition and preexisting chronic obstructive lung disease as we could not elicit an accurate history for the same. These factors do contribute to any lung injury. The study was done on patients who were admitted to the NICU. Those patients who developed aspiration pneumonia later or outside the NICU could not be included. This was because they were subjected to different treatment and nursing protocols which could not be monitored. We could not grade the severity of aspiration based on clinical findings and radiological features. Grading would have added further information on the risk factors and their strength in contributing to the severity.

CONCLUSION:

Aspiration pneumonia remains the most important cause of mortality amongst stroke patients. Majority of cases occur due to non implementation of preventive measures and late recognition. The high association of aspiration pneumonia with various clinical and radiological stroke severity numerical scales helps in early identification of patients who will develop aspiration pneumonia. Implementation of keeping these patients nil by mouth and later tube feeds will prevent the development of aspiration pneumonia and improve stroke outcome.
REFERENCES:


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